

Radiometric Characterization Results for the IKONOS Sensor

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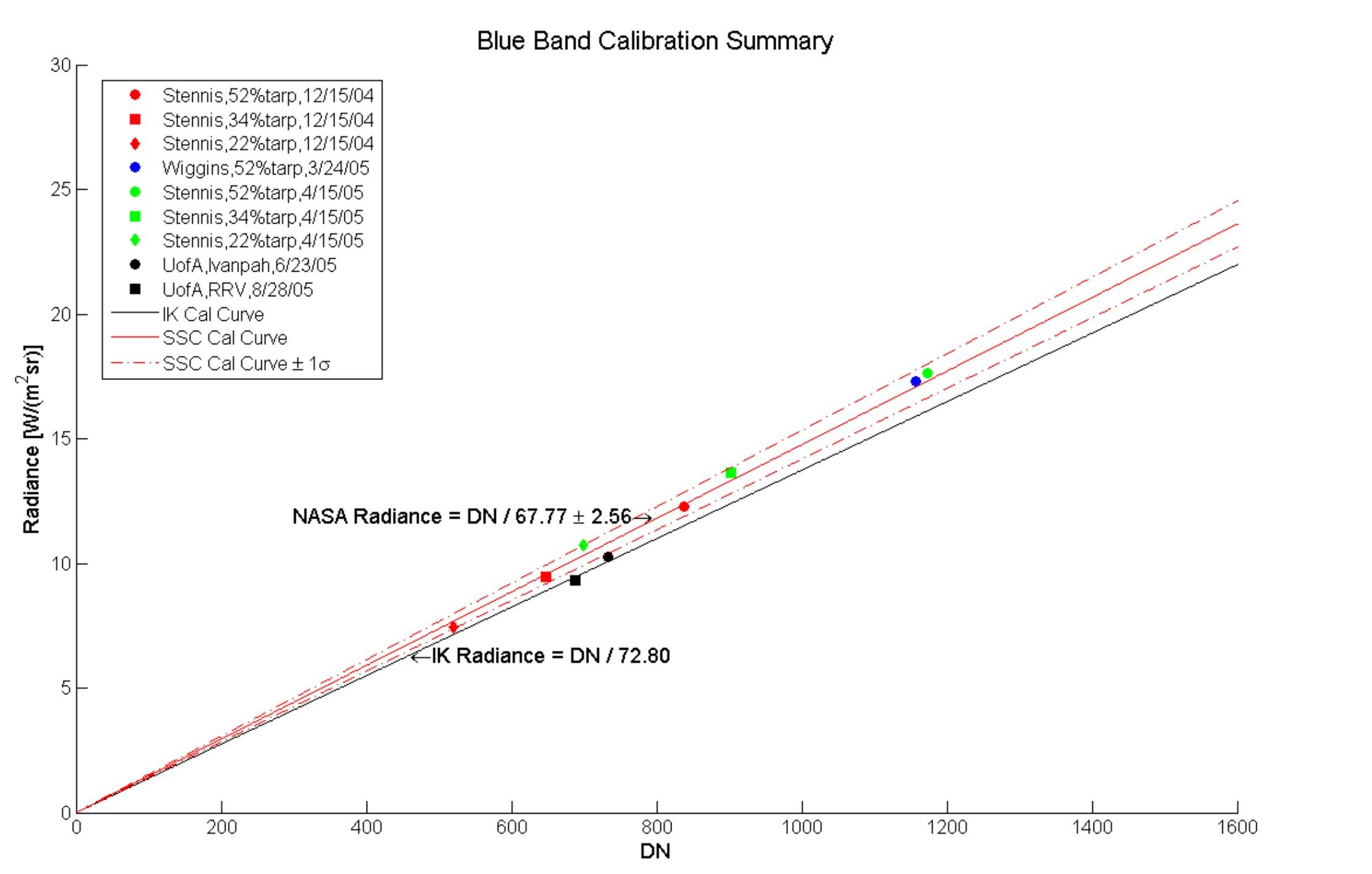
David Aaron, South Dakota State University Satellite Calibration Group & Image Processing Laboratory, Brookings, SD

Kurtis Thome, University of Arizona Remote Sensing Group, Tucson, AZ

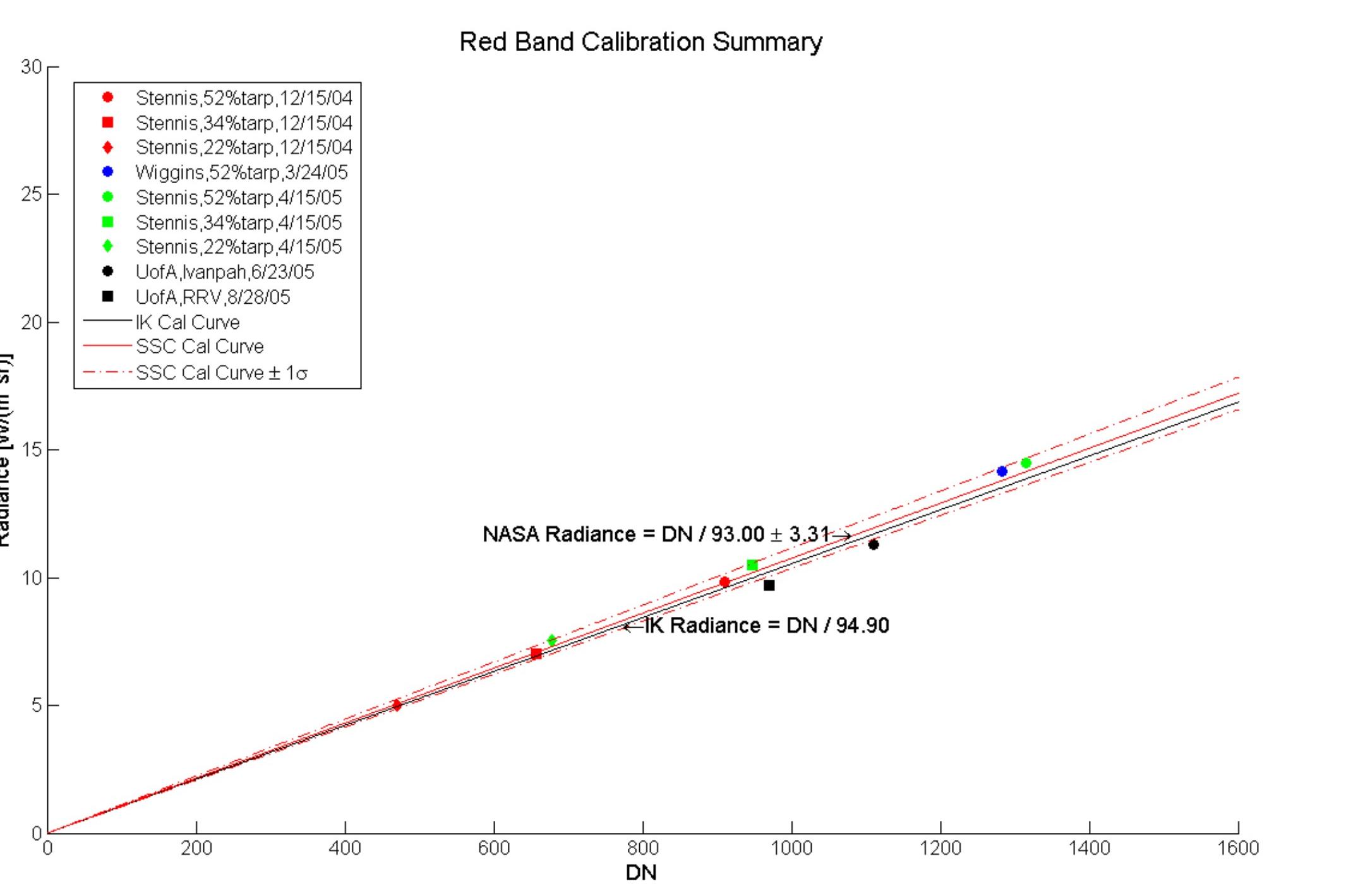


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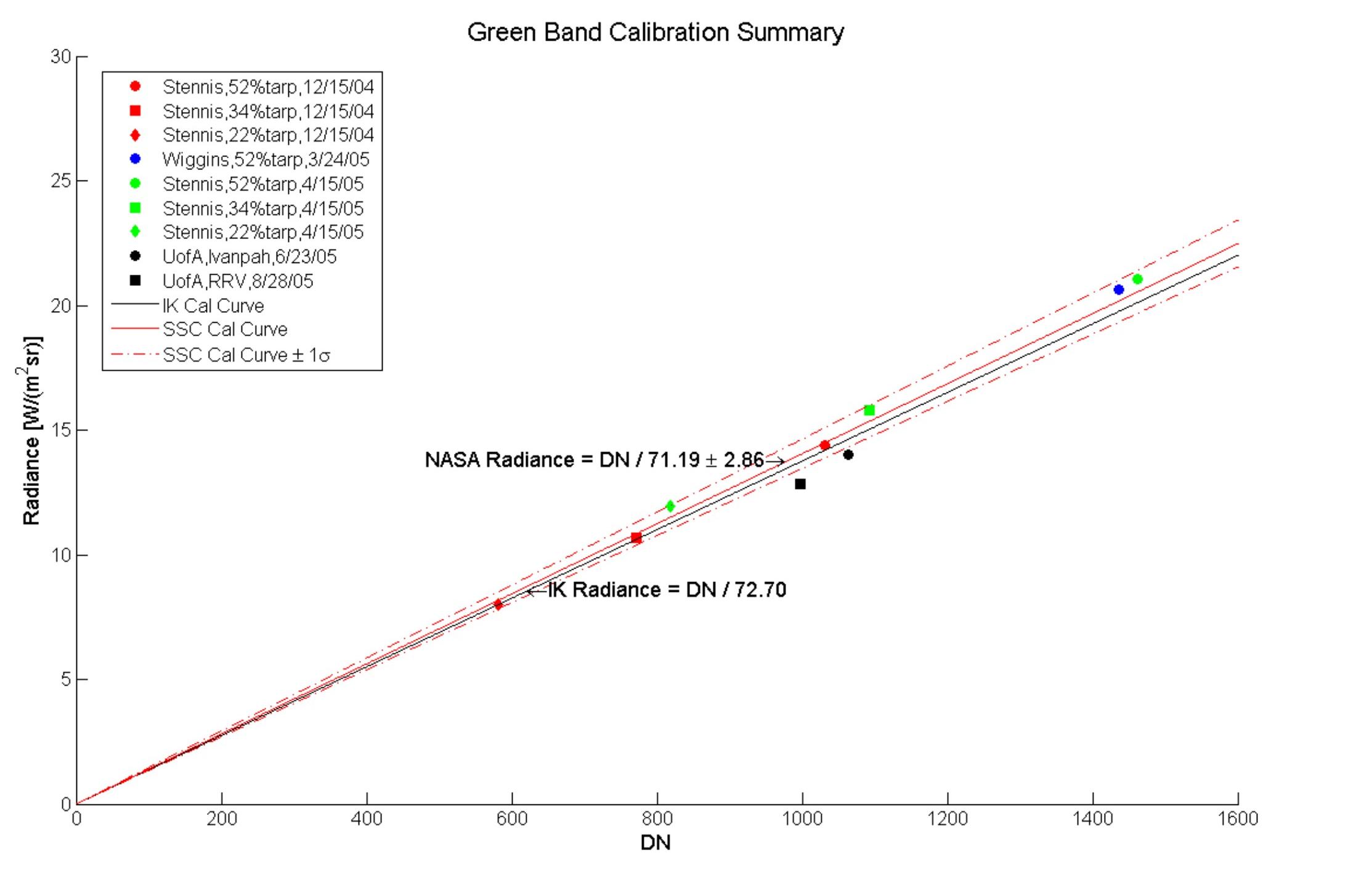
2004/2005 IKONOS Blue Band



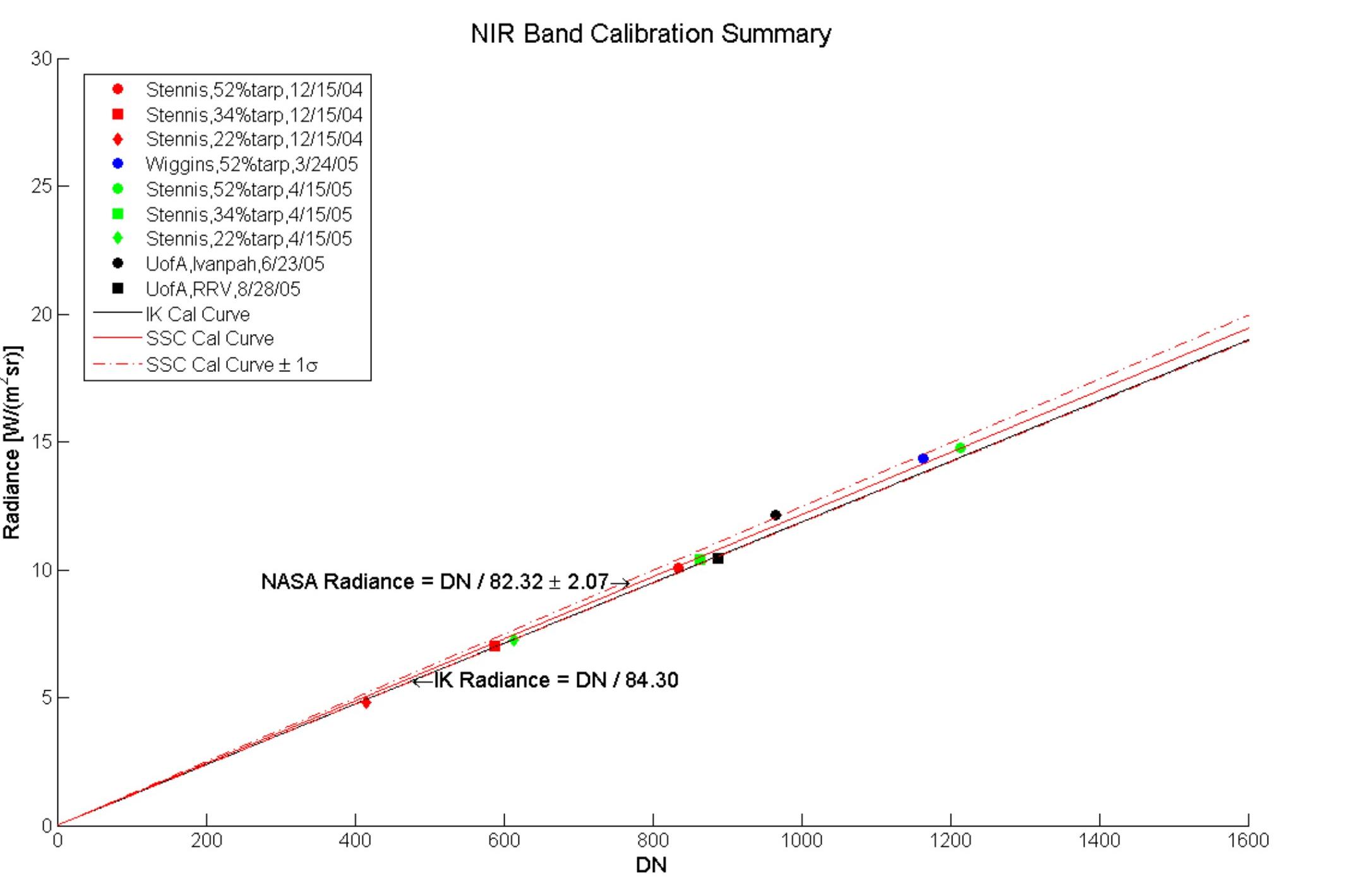
2004/2005 IKONOS Red Band



2004/2005 IKONOS Green Band



2004/2005 IKONOS NIR Band



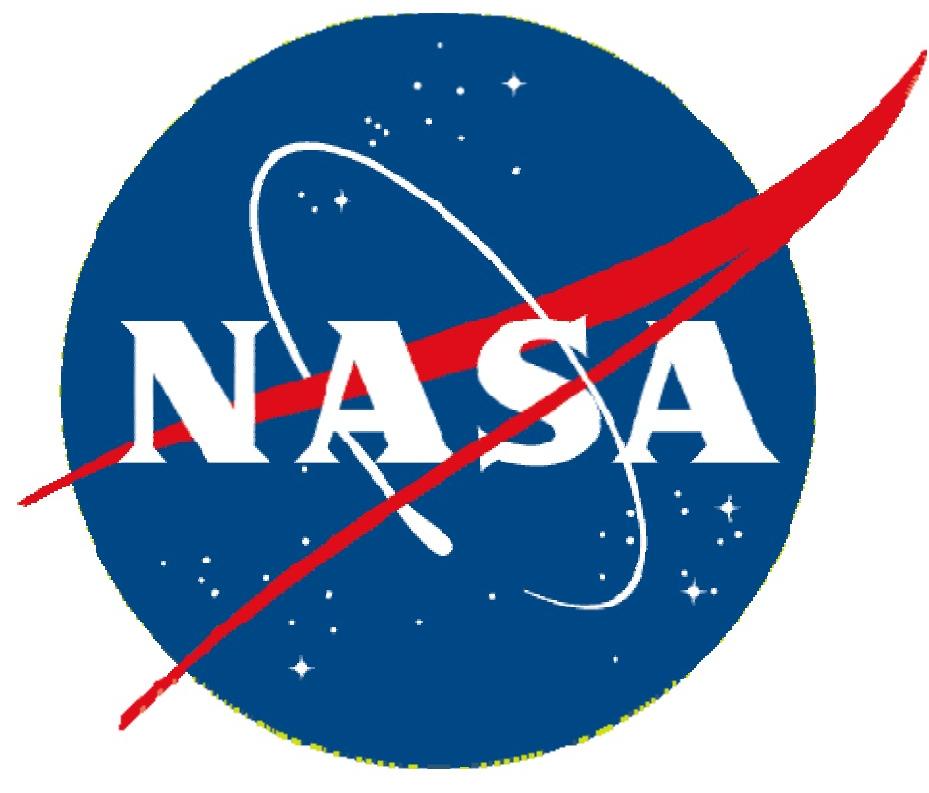
2004/2005 IKONOS Results

Bandwidth FWHM (μm)	NASA Team Estimate [$\text{DN}/(\text{W}/\text{m}^2 \text{sr})$]	IKONOS Provided [$\text{DN}/(\text{W}/\text{m}^2 \text{sr})$]	Percent Difference
1 0.450 - 0.520	67.8 ± 2.6	72.8	-7.4%
2 0.510 - 0.600	71.2 ± 2.9	72.7	-2.1%
3 0.630 - 0.700	93.0 ± 3.3	94.9	-2.0%
4 0.760 - 0.850	82.3 ± 2.1	84.3	-2.4%

Percent difference is calculated by $(1 - \text{IKONOS}/\text{NASA Mean})$

IKONOS Temporal Results

Band	NASA Estimate 2000*	NASA Estimate 2000 Scaled	NASA Estimate 2001	NASA Estimate 2002	NASA Estimate 2004/2005
Blue	64.2 ± 4.3	73.9 ± 4.9	73.2 ± 4.7	71.0 ± 4.7	67.8 ± 2.6
Green	65.4 ± 4.2	73.3 ± 4.7	76.6 ± 3.8	73.4 ± 5.0	71.2 ± 2.9
Red	88.1 ± 7.0	99.5 ± 7.9	101.8 ± 5.3	97.5 ± 7.7	93.0 ± 3.3
NIR	73.7 ± 3.8	83.3 ± 4.3	85.9 ± 4.2	82.7 ± 5.8	82.3 ± 2.1



Radiometric Characterization Results for the QuickBird Sensor

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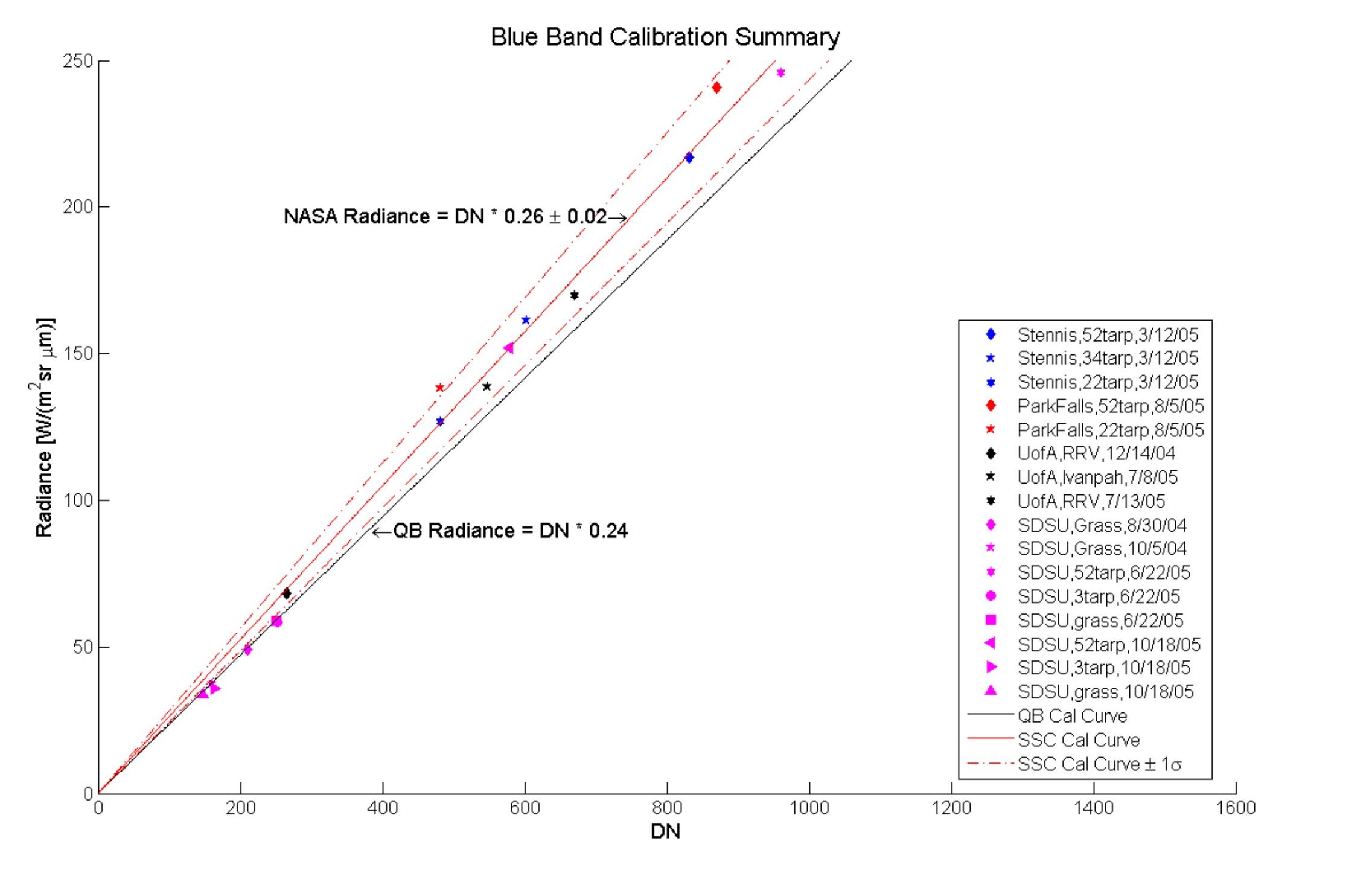
David Aaron, South Dakota State University Satellite Calibration Group & Image Processing Laboratory, Brookings, SD

Kurtis Thome, University of Arizona Remote Sensing Group, Tucson, AZ

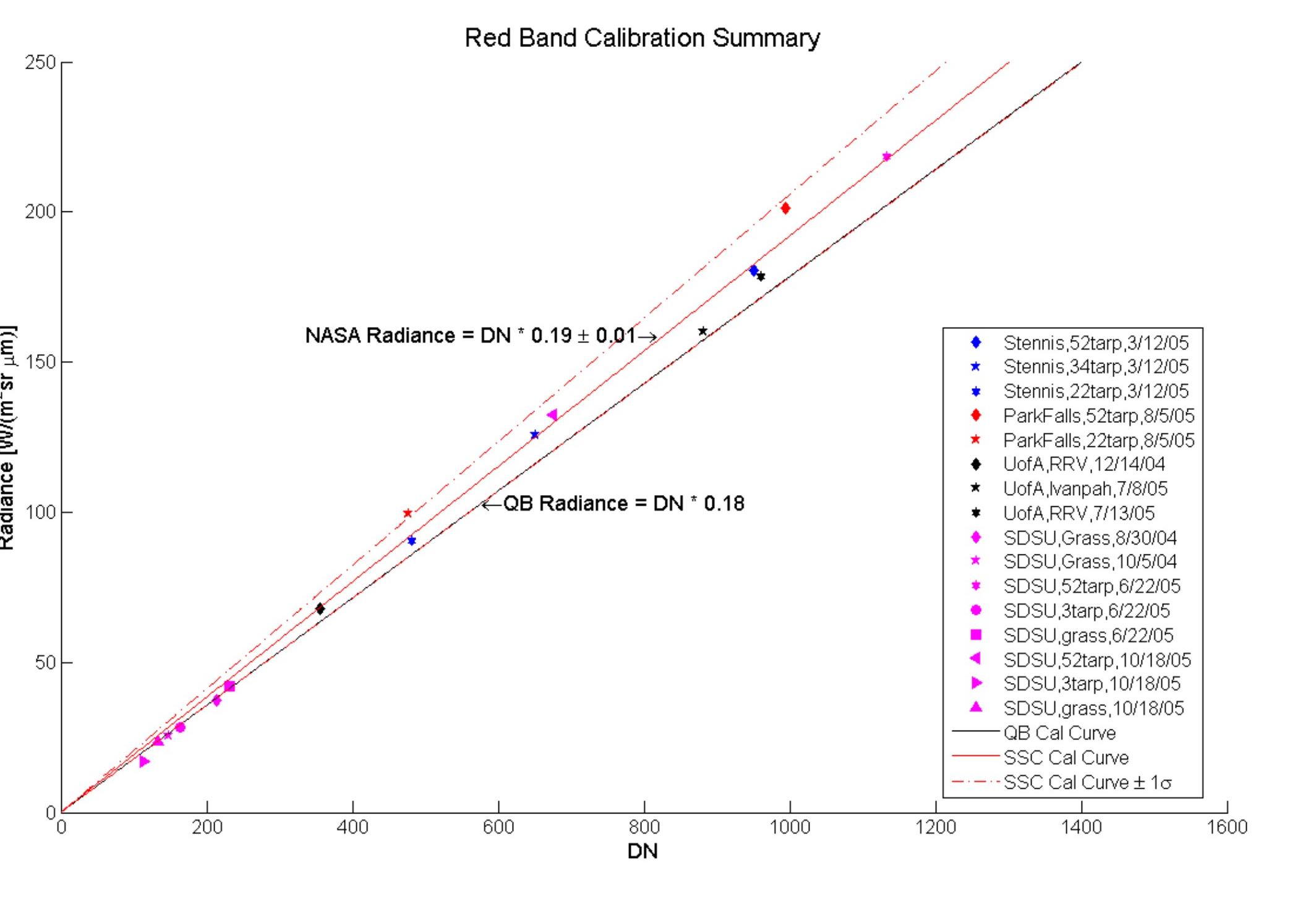


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2004/2005 QuickBird Blue Band



2004/2005 QuickBird Red Band

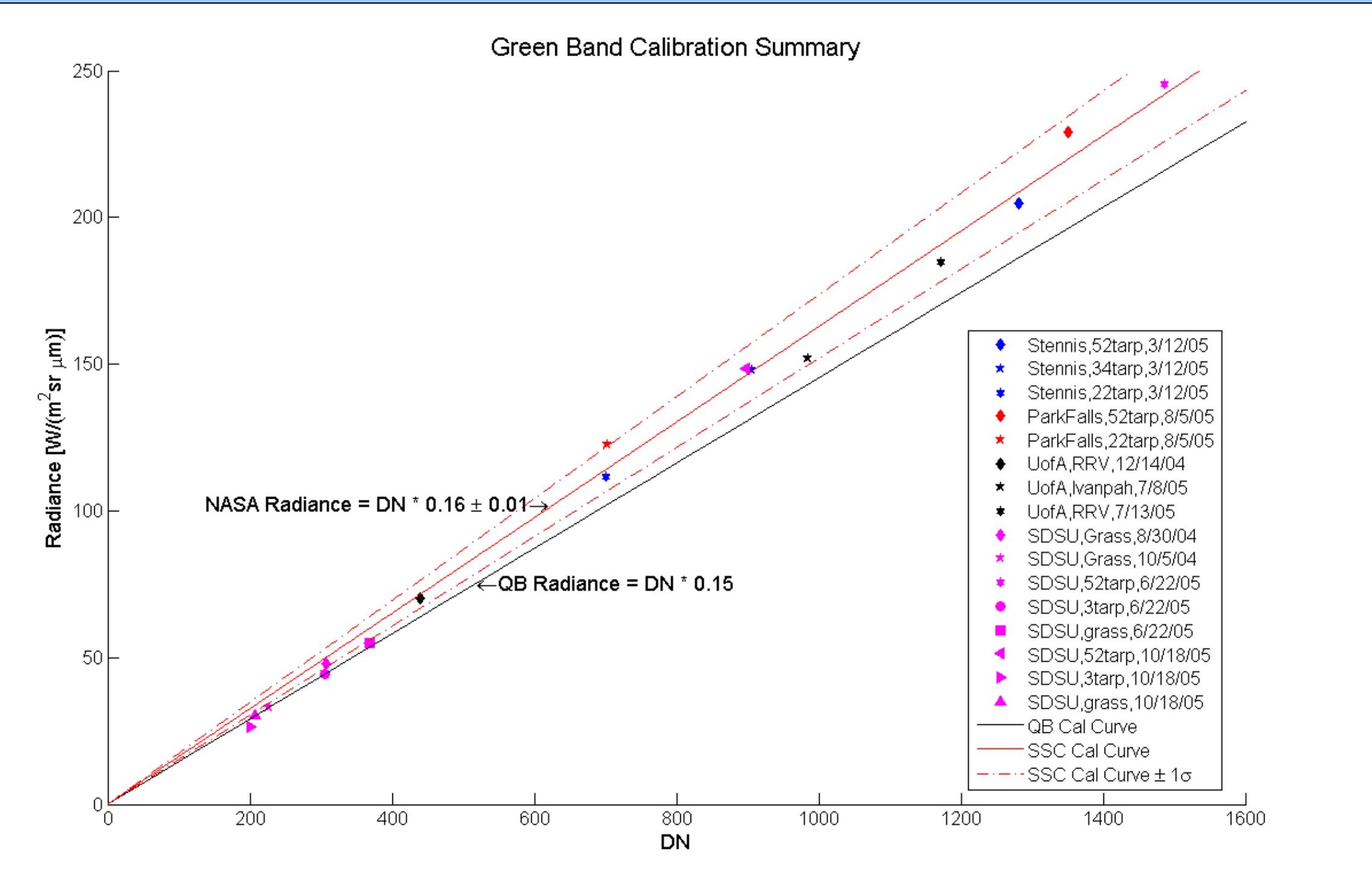


2004/2005 QuickBird Results

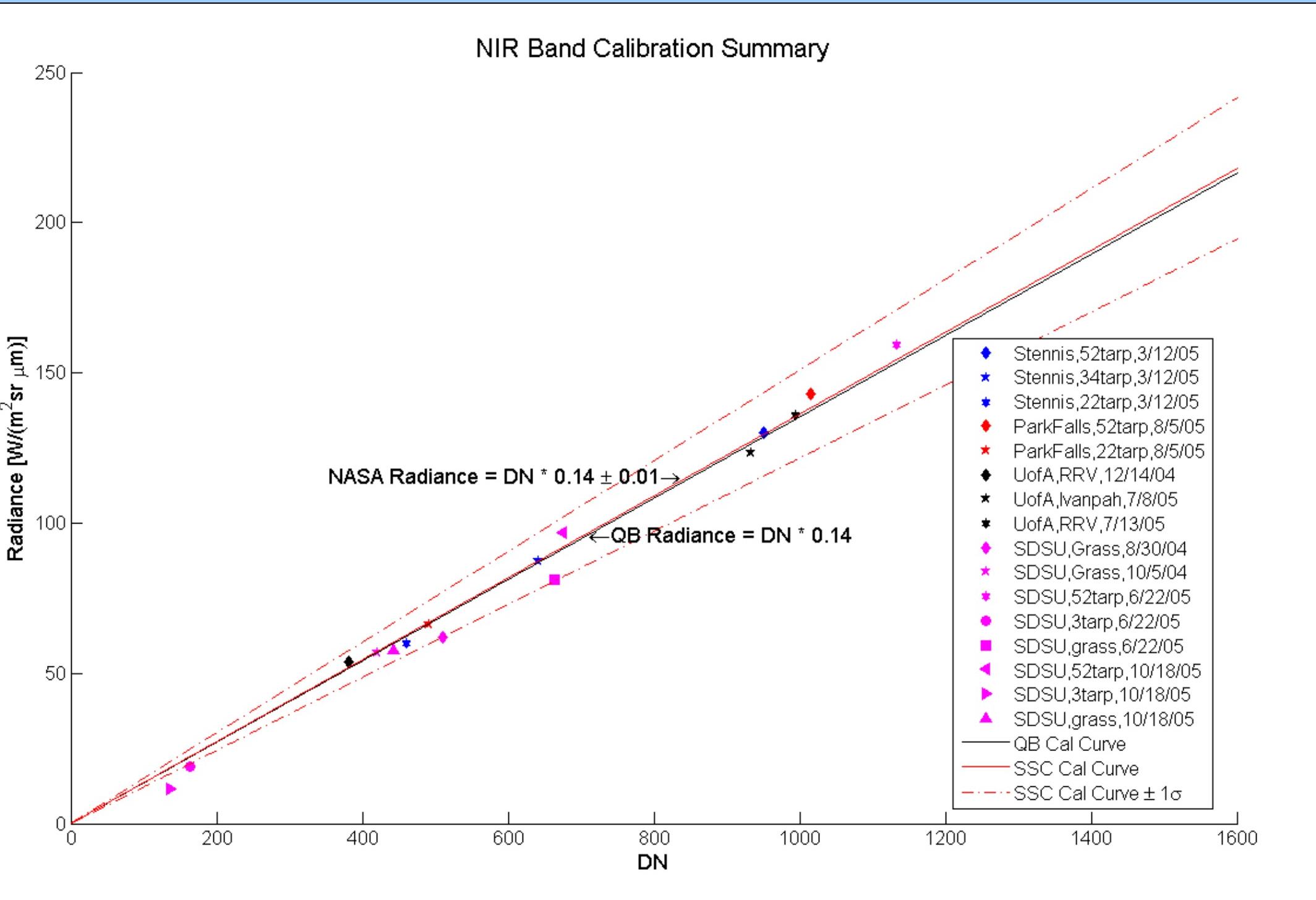
Bandwidth FWHM (μm)	NASA Team Estimate (W/m ² sr μm DN)	QuickBird Provided (W/m ² sr μm DN)	Percent Difference
1 0.445 - 0.510	0.26 ± 0.02	0.236	9.2%
2 0.500 - 0.595	0.16 ± 0.01	0.145	9.4%
3 0.620 - 0.690	0.19 ± 0.01	0.179	5.8%
4 0.755 - 0.875	0.14 ± 0.01	0.135	3.6%

Percent difference is calculated by $(1 - \text{QuickBird}/\text{NASA Mean})$

2004/2005 QuickBird Green Band

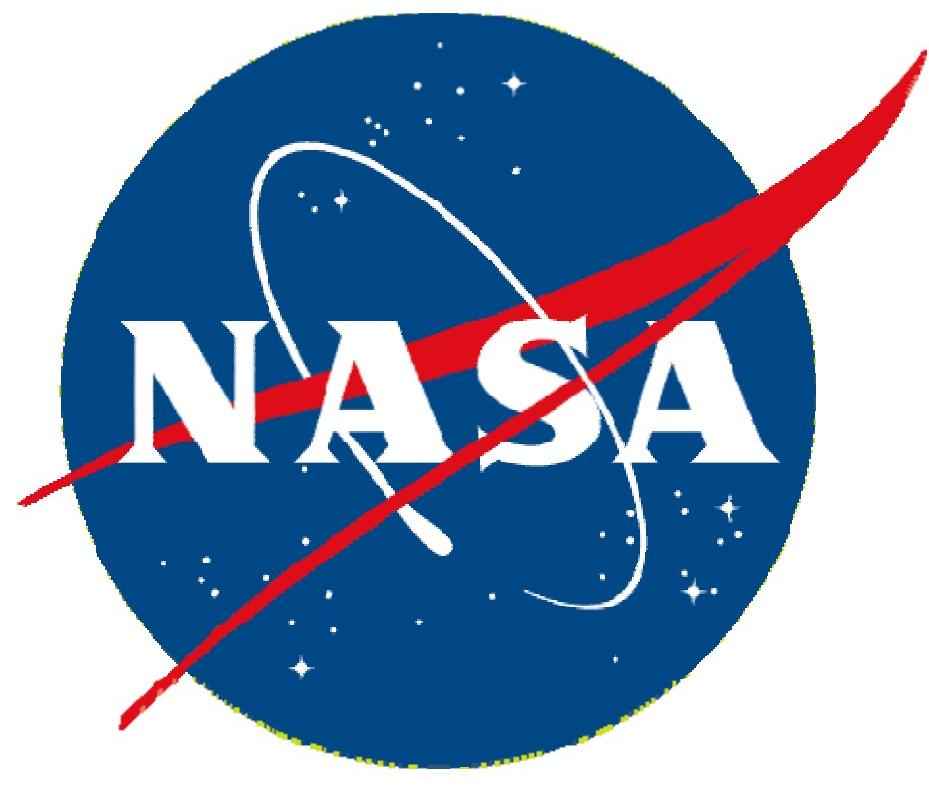


2004/2005 QuickBird NIR Band



QuickBird Temporal Results

Band	NASA Estimate 2003	NASA Estimate 2004	NASA Estimate 2004/2005
Blue	0.26 ± 0.01	0.26 ± 0.03	0.26 ± 0.02
Green	0.16 ± 0.01	0.16 ± 0.02	0.16 ± 0.01
Red	0.19 ± 0.01	0.19 ± 0.02	0.19 ± 0.01
NIR	0.14 ± 0.02	0.13 ± 0.02	0.14 ± 0.01



Radiometric Characterization Results for the OrbView-3 Sensor

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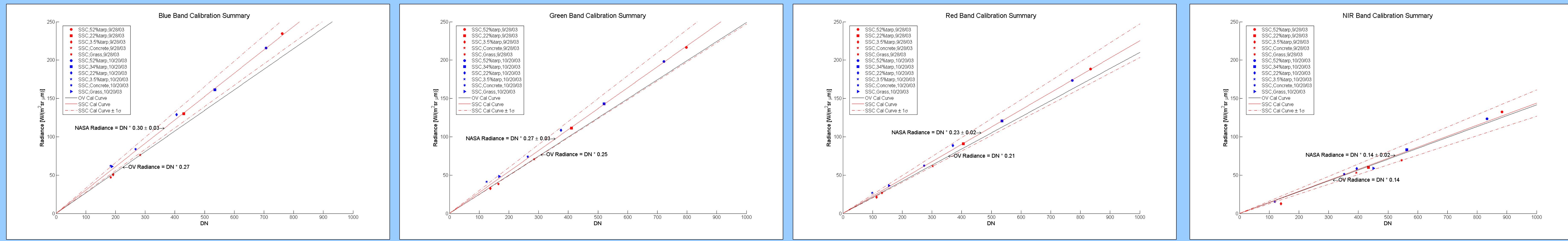
David Aaron, South Dakota State University Satellite Calibration Group & Image Processing Laboratory, Brookings, SD

Kurtis Thome, University of Arizona Remote Sensing Group, Tucson, AZ

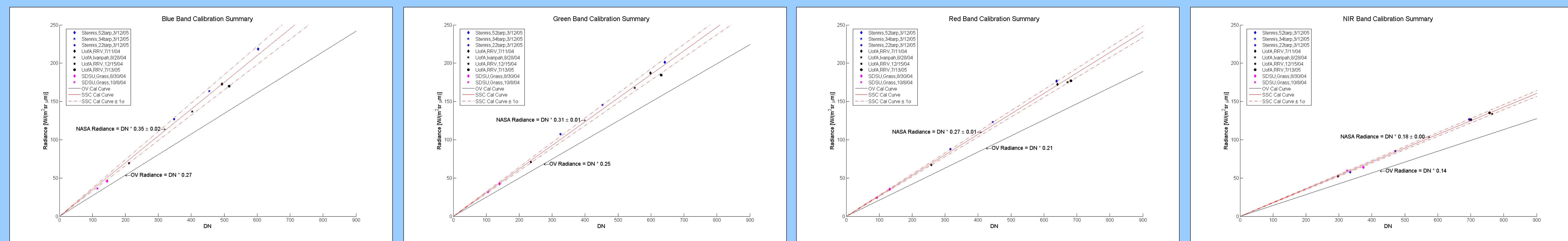


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Correction to the 2004 OrbView Calibration Summaries



2004/2005 OrbView Calibration Summaries



2004/2005 OrbView Results

Bandwidth FWHM (μm)	NASA Team Estimate ($\text{W/m}^2 \text{sr } \mu\text{m DN}$)	OrbView Provided ($\text{W/m}^2 \text{sr } \mu\text{m DN}$)	Percent Difference
1 0.450 - 0.520	0.35 ± 0.02	0.269	23.1%
2 0.520 - 0.600	0.31 ± 0.01	0.249	19.7%
3 0.625 - 0.695	0.27 ± 0.01	0.210	22.2%
4 0.760 - 0.900	0.18 ± 0.00	0.142	21.1%

Percent difference is calculated by $(1 - \text{OrbView}/\text{NASA Mean})$

OrbView Temporal Results

Band	NASA Estimate 2004/2005 and Percent Change
Blue	0.35 ± 0.02 14.3%
Green	0.31 ± 0.01 12.9%
Red	0.27 ± 0.01 14.8%
NIR	0.18 ± 0.01 22.2%

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14. ABSTRACT Radiometric calibration of commercial imaging satellite products is required to ensure that science and application communities can better understand commercial imaging satellite properties. Inaccurate radiometric calibrations can lead to erroneous decisions and invalid conclusions and can limit intercomparisons with other systems. To address this calibration need, the NASA Applied Sciences Directorate (ASD) at Stennis Space Center established a commercial satellite imaging radiometric calibration team consisting of three independent groups: NASA ASD, the University of Arizona Remote Sensing Group, and South Dakota State University. Each group independently determined the absolute radiometric calibration coefficients of available high-spatial-resolution commercial 4-band multispectral products, in the visible through near-infrared spectrum, from GeoEye™ (formerly Space Imaging®) IKONOS, DigitalGlobe® QuickBird, and GeoEye (formerly ORBIMAGE®) OrbView. Each team member employed some variant of a reflectance-based vicarious calibration approach, requiring ground-based measurements coincident with image acquisitions and radiative transfer calculations. Several study sites throughout the United States that covered a significant portion of the sensors' dynamic range were employed. Satellite at-sensor radiance values were compared to those estimated by each independent team member to evaluate the sensor's radiometric accuracy. The combined results of this evaluation provide the user community with an independent assessment of these sensors' absolute calibration values.						
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